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⑫ 公開特許公報(A)

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⑭ 発明の名称 繊維強化キャリバ鑄造法

⑮ 特 願 昭60-135026

⑯ 出 願 昭60(1985)6月20日

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明 細 書

1. 発明の名称

繊維強化キャリバ鑄造法

2. 特許請求の範囲

① 繊維巻取り用コアをほぼキャリバブリッジ部の内側形状に似せて作成し、該コアの周りに無機質繊維をシリンダ軸と平行な方向に巻取り、

② 巻取った繊維をほぼブリッジ形状に切断し、

③ 切断した繊維成形体にマトリックス金属を高圧鑄造してキャリバ形状とするか、またはブリッジ部を高圧鑄造した後、他の鑄造法によりキャリバの全体形状とする

ことを特徴とする繊維強化キャリバ鑄造法。

3. 発明の詳細な説明

(産業上の利用分野)

本発明は繊維強化キャリバの鑄造法に関するものであり、更に詳しくは無機質繊維集合体をマトリックス金属で複合化した補強材をキャリ

バのブリッジ部に簡便かつ正確に鑄ぐるむ方法に係わり、キャリバの重量を軽減するとともにその特性を向上せしめたものである。

(従来の技術および解決すべき問題点)

自動車用ディスクブレーキの部品であるキャリバボディには、従来 FCD (ダクタイル鑄鉄) が一般的に使用されてきたが、近年重量軽減の要求とともにアルミニウム化が検討されるようになり、一部量産化も行われている。しかしながらアルミニウム合金で鑄造したキャリバは、FCD を使用したものと比較して剛性が低下し、特に高温時の強度低下をきたすため、軽負荷のキャリバにしか使用できないという欠点がある。

(問題点を解決するための手段)

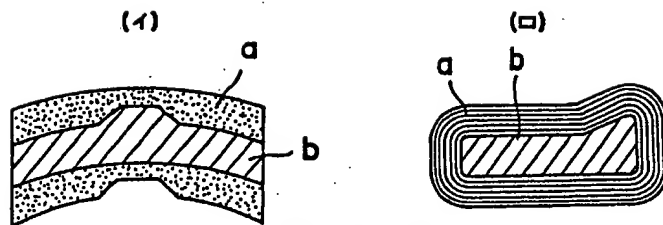
いわゆるフィスト型キャリバは、機能的に見て、ピストンの軸力を受けるブリッジ部、ピストンをガイドし液圧を保持するシリンダ部、およびキャリバをロータ軸と平行にガイドするガイド部の3つに分割できるが、このうち特に強度が必要とされる部分はブリッジ部である。本

d キャリバ

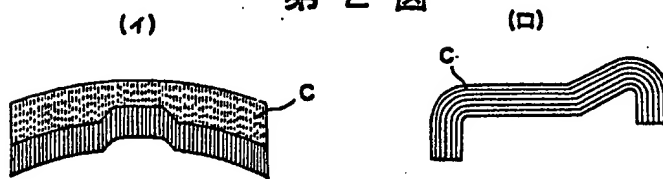
代理人 弁理士 箕 桶 清



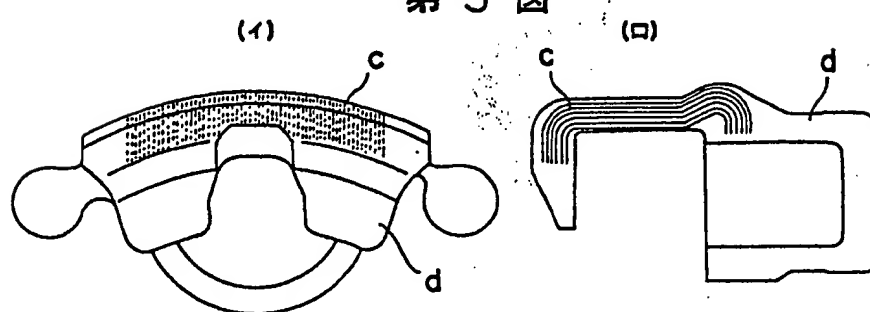
第 1 図



第 2 図



第 3 図



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(54) Name of the invention: Fiber Reinforced Caliper Casting Method

(21) Filed Number: Showa 60-135026

(22) Filed Date: Showa 60 (1985) 6/20

(71) Patent Assignee: Sho Brake Company

[Note: Names, addresses, company names and brand names are translated in the most common manner. Japanese language does not have singular or plural words unless otherwise specified by a numeral prefix or a general form of plurality suffix.]

Description of the Invention

1. Name of the Invention

Fiber Reinforced Caliper Casting Method

2. Scope of the Claims of the Invention

Fiber reinforced caliper casting method characterized by the fact that:

- (1) the core used for winding the fiber is produced so that it almost copies the inner side shape of the caliper bridge part, and around this core an inorganic type fiber is wound in a direction that is parallel to the direction of the cylinder axis,
- (2) the wound fiber is cut in almost a bridge type shape,
- (3) and on the cut fiber formed (molded) body a matrix metal is cast under high pressure and the caliper is formed, or the bridge part is cast under high pressure and after that through another casting the whole body shape of the caliper is made.

3. Detailed explanation of the invention

(Technological Sphere of Application)

The present invention is an invention about the fiber reinforced caliper casting method, and especially, the present invention is an invention about a method where a reinforced material, obtained as an inorganic material fiber bundle material is made into a composite material by using a matrix metal, is

simply and reliably cast on the caliper bridge part, and the caliper weight is reduced and together with that its properties are improved.

[Previous technology and problem points that must be solved]

In the caliper body that is part of the disc brakes used in automobiles, in the past, FCD (ductile cast iron) has been usually used. However, in recent years, together with the requirements for reduced weight experiments have been conducted for aluminization, and part of those have been commercialized. However, in the case of the calipers that have been cast by using aluminum, compared to the case when FCD has been used, the hardness (rigidity) properties have been decreased, and especially, at high temperatures there is a decrease of the strength, and because of that, there is the drawback point that these can be only used as light load calipers.

[Measures in order to solve the problem]

In the case of the so-called fist type calipers, mechanically speaking, they can be divided into 3 parts – the bridge part that receives the axial force of the piston, the cylinder part that stores the liquid which guides the piston, and the guide part, which guides the caliper parallel to the axis of the rotor. However, among these parts, especially, the part that requires strength is the bridge part. This invention is an invention where this bridge part is reinforced as a fiber that has high tensile strength and together with that a high elasticity properties is cast, and the drawbacks of the above described caliper manufactured from an aluminum alloy, are improved, and especially, as the casting method for the fiber bundle material, a simple and reliable method is designed, and the hardness properties and the high temperature strength properties of the caliper are improved.

Namely, the fiber reinforced caliper casting method according to the present invention is characterized by the fact that:

- (1) the core used for winding the fiber is produced so that it almost copies the inner side shape of the caliper bridge part, and around this core an inorganic type fiber is wound in a direction that is parallel to the direction of the cylinder axis,
- (2) the wound fiber is cut in almost a bridge type shape,

- (3) and on the cut fiber formed (molded) body a matrix metal is cast under high pressure and the caliper is formed, or the bridge part is cast under high pressure and after that through another casting the whole body shape of the caliper is made.

[Effect]

Regarding the manufacturing method for the preparation of fiber reinforced composite material where as the fiber forming material, as the matrix, cast iron, copper, aluminum, magnesium, titanium, or their alloys are used and they are filled and made into a composite material by using the high pressure solidification casting method, for example, it is known to be done according to the described in the Japanese Patent Report Number Showa 53-12446.

According to the fiber reinforced caliper casting method of the present invention, it is a method where as the matrix metal, copper, aluminum, magnesium, or their alloys are used, and the casting into the caliper shape is conducted by using the high pressure casting method, however, as a separate method, it is also possible to suggest the method where only the bridge part of the caliper is high pressure cast, and after that the casting of the whole body shape of the caliper is conducted according to the usual casting method, for example, the gravity casting method. Also, the method for the formation of the fiber bundle material according to the present invention is entirely independent from this patent application and it is conducted according to the method where around a core that almost copies the shape of inner side of the caliper bridge part, a fiber is wound in a direction that is parallel to the direction of the cylinder axis, and after that this fiber bundle material is cut to almost the bridge shape. By that, the casting of the fiber bundle material together with the inner part of the caliper bridge becomes even easier, and the method according to the present invention is a method that is very valuable for practical use.

As the high tensile strength, high elasticity fiber that can be used according to the present invention, asbestos, mineral wadding, glass fiber, dross fiber, Al₂O₃ (alumina) fiber, boron fiber, ceramics fiber etc., inorganic material fibers, or carbon fiber can be used. It is preferred that the diameter of the fiber is in the range of 2 microns ~ 20 microns. In the case when the thickness of the reinforced material where the fiber formed material is made into a composite material by using copper, aluminum, magnesium or their alloys, is in the range of 6 mm ~ 18 mm, it is preferred from the point of view of the goals of the present invention.

[Practical Examples]

Here below, the present invention will be explained in more details by using practical examples shown in the figures.

Figure 1, (i) and (ro), represent the state where the inorganic material fiber is wound on the core, Figure 2 (i) and (ro) represent the state where the wound fiber is cut, Figure 3 (i) and (ro) show the state where it has been cast into the caliper, and the method according to the present invention proceeds according to the order of the numbers of the figures. IN each figure, (i) represents the three-dimensional view diagram, and (ro) represents the side view diagram.

As it is clear from the figures, according to the present invention, first around the core (b), which is used to wind the fiber and that is produced so that it copies the shape of the inner side of the caliper bridge part, the fiber (a) is wound in the direction that is parallel to that of the cylinder axis, and the core (b) is taken out and removed and the fiber (a) is cut to almost the caliper bridge shape and the fiber formed material (c) is made, and onto the above fiber formed material (c), as a matrix, copper, aluminum, magnesium, or their alloys are used and they are cast under high pressure, and by that the caliper (d) is formed, or the bridge part was cast under high pressure and after that by using another casting method the whole body shape of the caliper (d), was formed.

4. Simple explanation of the figures

Figure 1 (i) and (ro), represent the state where the inorganic material fiber is wound on the core, Figure 2 (i) and (ro) represent the state where the wound fiber is cut, Figure 3 (i) and (ro) show the state where it has been cast into the caliper, and the method according to the present invention proceeds according to the order of the numbers of the figures. In each figure, (i) represents the three-dimensional view diagram, and (ro) represents the side view diagram. In the figures:

a... .. .fib
b... .. .cor
c... .. .fib
material (body)

d... ..cal

Patent Assignee: Sho Break Company

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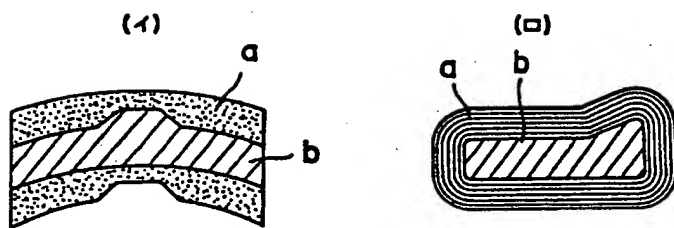
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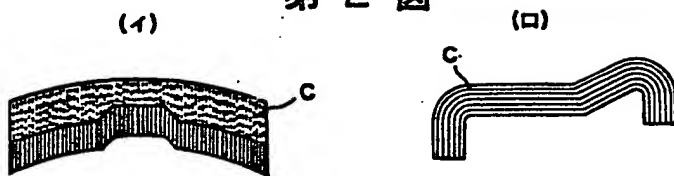
代理人 弁理士 箕 舘 清



第 1 図



第 2 図



第 3 図

